Chapter 5. Example Initial Emissions Inventory

This chapter presents an example of an initial EI for a hypothetical site producing and processing natural gas. Carefully consult the materials in Chapters 3 and 4 in conjunction with this example.

Identifying Emission Sources

The following processes occur at an upstream gas field site (hypothetical):
- Natural gas production.

- Separation of natural gas and liquids.

- Natural gas sweetening.

- Natural gas dehydration.

- Natural gas compression and delivery to a pipeline.

- Storage of condensate and natural gas liquids.

- Loading of condensate on trucks.

- Blowdown operations.

The following equipment is involved in the above processes:
- Lift pump and associated electric motor.

- Gunbarrel separator (initial gas-liquids separation).

- Amine unit, associated heater, and diethylamine storage tank.

- Glycol dehydration still, associated heater, and ethylene glycol storage tank.

- Emergency flare to control glycol unit and amine unit emissions events, as well as blowdowns.

- Refrigerated absorption unit and fractionation columns (further gas-liquids separation).

- Compressor engines:

- One 2000 hp turbine with dual exhaust stacks.

- One 1200 hp lean-burn, 4-stroke engine,

- One 1000 hp rich-burn, 4-stroke engine with a 70 percent–efficient nonselective catalytic reduction (NSCR) system.

- Two 1500 gallon condensate fixed-roof storage tanks.

- One condensate truck loading rack (uncontrolled).

- Blowdown equipment.

Analyzing the two above lists, the following emission sources can be identified.

Table 5-1. Identifying Emission Sources from Equipment and Processes for a Hypothetical Upstream Gas-Field Site

Equipment or Process	Emission Source
Lift pump and associated electric motor	Piping fugitive components (including pump)
Gunbarrel separator	Gunbarrel separator: flash emissions
Gunbarrel separator	Piping fugitive components
Natural gas sweetening	Amine unit: H_2S emissions
Natural gas sweetening	Amine heater unit: combustion emissions
Natural gas sweetening	Diethylamine storage tank
Natural gas sweetening	Piping fugitive components
Natural gas dehydration	Glycol still: VOC and HAP emissions
Natural gas dehydration	Glycol heater unit: combustion emissions
Natural gas dehydration	Glycol-still flash tank: VOC and HAP emissions
Natural gas dehydration	Ethylene glycol storage tank
Natural gas dehydration	Piping fugitive components
Refrigerated absorption unit and frac-tionation columns	Piping fugitive components
Compressor engines	Turbine
Compressor engines	Lean-burn four-stroke engine
Compressor engines	Rich-burn four-stroke engine
Compressor engines	Piping fugitive components
Flaring of emissions events	Emergency flare: combustion emissions

Equipment or Process	Emission Source
Flaring of emissions events	Source that generated emissions events (amine unit, blowdown, etc.)
Flaring of emissions events	Piping fugitive components
Condensate storage	First 1500 gal condensate fixed-roof storage tank
Condensate storage	Second 1500 gal condensate fixed-roof storage tank
Condensate storage	Piping fugitive components
Condensate truck loading	Loading rack: loading emissions
Condensate truck loading	Piping fugitive components
Natural gas liquids storage	Piping fugitive components, especially relief valves
Gas delivery to pipeline	Piping fugitive components
Blowdown operations	Blowdown equipment

Representing Emission Sources in the Emissions Inventory

Sources (Facilities). After the emission sources have been identified, they must be added to the inventory in the STEERS-AEIR Web-EI system, using either the interactive Web entry or text-file upload. Review Chapter 3, "Emissions Inventory Structure," in conjunction with this chapter.

For an EI, a *facility* is defined as a unique unit, device, structure, or area capable of generating emissions. The sources listed in Table 5-1 are all emission sources at the site. Each source that will be reported in the EI must be assigned a unique FIN by the owner or operator. The EI naming conventions (for facilities as well as emission points) must follow the naming conventions of any associated permits. A list of FINs (and their corresponding emission sources) for the hypothetical site appears in Table 5-2.

Table 5-2. Assigning FINs to Emission Sources for a Hypothetical Upstream Gas-Field Site

Emissions Source	FIN
All natural gas piping fugitive components	FUGAREA1
All condensate piping fugitive components	CONDFUGS
Gunbarrel separator	GUNBARSEP
Amine unit	AMINEUNIT

Emissions Source	FIN
Amine heater unit	AMHEATER
Diethylamine storage tank	DEA-TANK
Glycol still	GLYCOLSTIL
Glycol heater unit	GLHEATER
Ethylene glycol storage tank	EG-TANK
Turbine	TURBINE1
Lean-burn four-stroke engine	COMP1
Rich-burn four-stroke engine	COMP2
Emergency flare	UPSETFLARE
First 1500 gal condensate fixed-roof storage tank	CONDTANK1
Second 1500 gal condensate fixed-roof storage tank	CONDTANK2
Loading rack: loading emissions	LOADRACK
Blowdown operations	BLOWDOWN

Note that, in Table 5-2, piping fugitive components are grouped together into two facilities: one equipment leak fugitive facility for the natural gas streams, and one equipment leak fugitive facility for the condensate streams. If an emission source handles similar process streams, uses the same emissions determination methodology, and is monitored under the same monitoring program, all components will be grouped under one facility. See Technical Supplement 3 in Appendix A for more details on creating facilities for piping component fugitive areas.

Emissions points. Once all of the FINs have been assigned for the emission sources, their associated emission points must be identified. From Tables 5-1 and 5-2, most of the sources' emission points can be identified. However, **all possible** emission points for a facility have to be listed. Based on this information, Table 5-3 lists all possible emission points identified for the sources listed in Table 5-2.

Table 5-3. Identifying Emissions Points for FINs for a Hypothetical Upstream Gas-Field Site

FIN	Emissions Point(s)
FUGAREA1	Fugitive area encompassing piping component fugitives in natural gas service
CONDFUGS	Fugitive area encompassing piping component fugitives in condensate service
GUNBARSEP	Separator vent
AMINEUNIT	Amine unit vent
AMINEUNIT	Flare (during emissions events)
AMHEATER	Heater stack
DEA-TANK	Tank vent
GLYCOLSTIL	Glycol still vent
GLYCOLSTIL	Flare (during emissions events)
GLHEATER	Heater stack
EG-TANK	Tank vent
TURBINE1	Stack one (dual exhaust stack)
TURBINE1	Stack two (dual exhaust stack)
COMP1	Compressor stack
COMP2	Compressor stack
UPSETFLARE	Flare
CONDTANK1	Tank vent
CONDTANK2	Tank vent
LOADRACK	Area where fugitive loading emissions escape
BLOWDOWN	Emergency flare

In Table 5-3, all facilities that are able to route their emissions from emissions events have the flare as an emission point. Each emission point must be assigned a unique EPN. The EI naming conventions for EPNs must follow the same naming conventions as their air permit. Table 5-4 lists the FINs and their corresponding EPNs.

Table 5-4. Assigning EPNs to Emissions Points for a Hypothetical Upstream Gas-Field Site

FIN	Emissions Point(s)	EPN
FUGAREA1	Fugitive area encompassing piping component fugitives	FUGAREA1
CONDFUGS	Fugitive area encompassing piping component fugitives	CONDFUGS
GUNBARSEP	Separator vent	SEPVENT
AMINEUNIT	Amine unit vent	AMINEVENT
AMINEUNIT	Flare (during emissions events)	FLARE
AMHEATER	Heater stack	HEATERSTK1
DEA-TANK	Tank vent	DEA-TANK
GLYCOLSTIL	Glycol still vent	GLYCOLVENT
GLYCOLSTIL	Flare (during emissions events)	FLARE
GLHEATER	Heater stack	HEATERSTK2
EG-TANK	Tank vent	EG-TANK
TURBINE1	Stack one (dual exhaust stack)	TURBSTK1
GLYCOLSTIL	Stack two (dual exhaust stack)	TURBSTK2
COMP1	Compressor stack	COMP1STK
COMP2	Compressor stack	COMP2STK
UPSETFLARE	Flare	FLARE
CONDTANK1	Tank vent	CONDTANK1
CONDRANK2	Tank vent	CONDTANK2
LOADRACK	Fugitive loading emissions area	LOADFUGS
BLOWDOWN	Emergency flare	FLARE

Control Devices. Control devices must be added to the appropriate paths. From the information in Table 5-4, control devices must be added to the following FIN/EPN paths:

- AMINEUNIT / FLARE

- GLYCOLSTIL / FLARE

- COMP2 / COMP2 (remember, this engine has NSCR controls)

- BLOWDOWN / FLARE

Each control device must be assigned a unique CIN. Table 5-5 lists the FINs, the EPNs, and their associated CINs.

**Table 5-5. Assigning CINs to Paths for a
Hypothetical Upstream Gas-Field Site**

FIN	EPN	CIN (if applicable)
FUGAREA1	FUGAREA1	--
CONDFUGS	CONDFUGS	--
GUNBARSEP	SEPVENT	--
AMINEUNIT	AMINEVENT	--
AMINEUNIT	FLARE	FLARE
AMHEATER	HEATERSTK1	--
DEA-TANK	DEA-TANK	--
GLYCOLSTIL	GLYCOLVENT	--
GLYCOLSTIL	FLARE	FLARE
GLHEATER	HEATERSTK2	--
EG-TANK	EG-TANK	--
TURBINE1	TURBSTK1	--
TURBINE1	TURBSTK2	--
COMP1	COMP1STK	--
COMP2	COMP2STK	NSCR

FIN	EPN	CIN (if applicable)
UPSETFLARE	FLARE	--
CONDTANK1	CONDTANK1	--
CONDTANK2	CONDTANK2	--
LOADRACK	LOADFUGS	--
BLOWDOWN	FLARE	FLARE

Creating EI Structure. Emission paths can be created using the STEERS-AEIR Web-EI system by linking together the appropriate FIN/EPN/CIN for each path. Additional information on submitting an IEI through the STEERS-AEIR Web-EI system is available at the EAS webpage, www.tceq.texas.gov/goto/ieas. Facility information is required for different types of processes or units depending on the profile:

- cleaning

- coating or printing

- cooling tower

- flare (combustion unit—flare profile)

- leaking component fugitives

- loading

- non-flare combustion unit

- storage tank

- VOC process

- wastewater system

- wastewater system component

- other facility

The agency requires information on different types of emission points depending on the profile:

- flare

- fugitive

- stack

Abatement-device information is required for control devices.

For this hypothetical site, Table 5-6 lists the appropriate groups and profiles to select when adding structure for facilities and emission points to the EI. To supply the required information online, use the STEERS-AEIR Web-EI system.

If a facility has multiple emission points, the facility information is only completed **once** to add the facility. The facility can then be linked to its multiple emission points in the STEERS-AEIR Web-EI system. Add the **one** facility, add all its emission points, and then link the facility to each of its emission points to create each emissions path.

Similar procedures can also be used for emission points and abatement devices that have multiple paths.

Completing Path Information. Emissions data must be completed for each path shown in Table 5-6. Use the information in Table 5-6 to complete the structure in the account.

Material throughput forms necessary for supplying process rate data and sample calculations used in emissions determinations can be attached to the EI in the STEERS-AEIR Web-EI system.

Refer to Appendix A for information on determining emissions from common sources.

Additional information on submitting an IEI through the STEERS-AEIR Web-EI system is located at the EAS webpage, www.tceq.texas.gov/goto/ieas.

Table 5-6. Selecting Group Types and Profiles for a Hypothetical Upstream Gas-Field Site

Appropriate FIN and Group Type / Profile	Appropriate EPN Profile	CIN
FUGAREA1: Fugitives / Equipment Leak Fugitives	FUGAREA1: Fugitive-type EPN	--
CONDFUGS: Fugitives / Equipment Leak Fugitives	CONDFUGS: Fugitive-type EPN	--
GUNBARSEP: VOC Process / Other VOC Processes	SEPVENT: Stack-type EPN	--
AMINEUNIT: Other / Other	AMINEVENT: Stack-type EPN	--

Appropriate FIN and Group Type / Profile	Appropriate EPN Profile	CIN
AMINEUNIT: Other / Other	FLARE: Flare-type EPN	FLARE
AMHEATER: Combustion / Heater	HEATERSTK1: Stack-type EPN	--
DEA-TANK: Tanks / (tank profile information as appropriate)	DEA-TANK: Stack-type EPN	--
GLYCOLSTIL: VOC Process / Glycol Still	GLYCOLVENT: Stack-type EPN	--
GLYCOLSTIL: VOC Process / Glycol Still	FLARE: Flare-type EPN	FLARE
GLHEATER: Combustion / Heater	HEATERSTK2: Stack-type EPN	--
EG-TANK: Tanks / (tank profile information as appropriate)	EG-TANK: Stack-type EPN	--
TURBINE1: Combustion / Turbine	TURBSTK1: Stack-type EPN	--
TURBINE1: Combustion / Turbine	TURB2STK: Stack-type EPN	--
COMP2: Combustion / I.C. Engine	COMP2STK: Stack-type EPN	NSCR
UPSETFLARE: Combustion / Flare	FLARE: Flare-type EPN	--
CONDTANK1: Tanks / (tank profile information as appropriate)	CONDTANK1: Stack-type EPN	--
CONDTANK2: Tanks / (tank profile information as appropriate)	CONDTANK2: Stack-type EPN	--
LOADRACK: Loading / (loading profile information as appropriate)	LOADFUGS: Fugitive-type EPN	--
BLOWDOWN: VOC Process / Blowdown Operations	FLARE: Flare-type EPN	FLARE